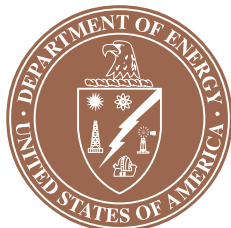


Safeguards Technology Training Program

Sponsored through the US DOE Central Training Academy



Los Alamos
NATIONAL LABORATORY

**2000 Course Offerings
and General Course
Descriptions**





Training for Excellence in Safeguards

The Los Alamos/Department of Energy (DOE) Safeguards Technology Training program began in 1973 with a single, week-long training course on the *Fundamentals of Nondestructive Assay of Nuclear Material*. The program has grown over the succeeding 27 years to a roster of eight courses that serve the full DOE complex and the domestic nuclear facilities. The courses offered by the Los Alamos Nuclear Safeguards staff are a unique resource for the support of US nuclear materials accounting and safeguards and US nonproliferation policies. The courses are taught by research staff and involve actual hands-on measurement exercises with an extensive inventory of highly characterized nuclear material samples and with instrumentation currently available for field and in-plant measurements. Demand for these laboratory nondestructive assay (NDA) courses is high, in view of the increased emphasis by the Department of Energy on materials accounting and the need for technical support of US nonproliferation initiatives.

Presented in this booklet are brief synopses of the current repertoire of courses offered through the LANL/DOE Safeguards Technology Training Program. The offerings for fiscal year 2000 are listed immediately after the year's calendar of courses. The rest of the available courses, to be offered in future years, are listed next.

The cost of each course is \$500 for all but DOE federal employees, who are charged only a \$150 materials and supplies fee.

For more information, contact:

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Safeguards Technology Training Program
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Safeguards Technology Training Schedule for Calendar Year 2000

For more details on the individual courses available from this program, see the following pages.

January	February 7-11 Nondestructive Assay of Special Nuclear Material Holdup MCA-243	March 13-17 Materials Accounting for Nuclear Safeguards MCA-111	April 10-14 Waste and Residue (tent.) Nondestructive Assay Measurements MCA-248
May 15-19 Gamma-Ray Spectroscopy for Nuclear Materials Accounting MCA-343	June 12-16 Nondestructive Assay Techniques for Safeguards Practitioners MCA-241	July	August
September 13-15 Statistical Concepts in Safeguards MCA-230	October 16-20 Calorimetry Assay Training Course MCA-244	November	December

For additional information,
see the LANL/DOE Safeguards Technology Training web site:

http://www.nis5.lanl.gov/Training/training_home_page.htm

Nondestructive Assay of Special Nuclear Material Holdup (MCA-243)

February 7–11, 2000

Designed for experienced practitioners in the area of nuclear material assays for material accounting and process control. The course is open to DOE employees, contractors, and facility personnel who manage or perform nuclear material assays and who manage or perform holdup measurement campaigns. Employees of other organizations are accepted on a space-available basis.

Course length — 4.5 days (36 hours)

This course covers applying basic NDA techniques and field-portable instruments to measure nuclear material holdup deposits in process equipment and ductwork. Laboratory exercises emphasize procedures for measuring uranium and plutonium holdup, using calibrated gamma-ray and neutron instrumentation, and applying a generalized-geometry approach. Measurements are performed on simulated deposits using special nuclear material (SNM) standards inserted within items (pipes, ducts, tanks, blenders, etc.) that represent process equipment hardware. Equipment attenuation, geometric effects, and self-attenuation effects are also covered. Laboratory experiments are supplemented with lectures on topics related to holdup measurements. Activities involve the use of radioactive materials. Attendance is limited to 24 students.

Goals of the course

- Provide first-hand measurement experience using portable NDA equipment.
- Demonstrate the measurement strategies and techniques that minimize uncertainties.
- Provide knowledge of the generalized-geometry approach to calibration and data analysis for the varied measurement geometries encountered in holdup measurement campaigns.

Prerequisites Previous experience with nuclear radiation measurement equipment and familiarity with nuclear radiation and associated mathematics are assumed. Although not required, successful completion of CTA course MCA-140 (see page 13) is recommended.

Technical Contact Phyllis Russo 505-667-2160 prusso@lanl.gov

January 2000

February 7–11
MCA-243

March 13–17
MCA-111

April 10–14*
MCA-248

May 15–19
MCA-343

June 12–16
MCA-241

July

August

September 13–15
MCA-230

October 16–20
MCA-244

November

December

* tentative

Materials Accounting for Nuclear Safeguards (MCA-111)

March 13–17, 2000

Designed for DOE employees, contractors, and facility personnel who operate, manage, or evaluate materials accounting systems. Employees of other organizations are accepted on a space-available basis.

Course length — 4.5 days (36 hours)

The course covers methods for designing and implementing conventional and near-real-time accounting systems for safeguarding nuclear material. Lecture topics include basic materials accounting concepts, the structure of safeguards systems, measurement technology, measurement control, statistical basis of materials accounting, nuclear material holdup, materials accounting at specific types of facilities, materials control and accountability (MC&A) system decision analysis and detection sensitivities, and international safeguards. Short workshops are conducted on topics such as NDA measurement technology, measurement statistics, simulation of materials accounting, measurement control, and error propagation. Attendance is limited to 35 students.

Goals of the course

- Provide the basic concepts of nuclear materials accounting systems.
- Identify the roles of the associated technologies and techniques to operate such a system.
- Provide the basic criteria for a successful and compliant system and how to evaluate the performance and identify improvements in such systems.

Prerequisites Familiarity with the nuclear fuel cycle and experience in nuclear facility operations is assumed. Although not required, completion of CTA course MCA-101 is recommended.

Technical Contact Kory Sylvester 505-665-9200 ksylvester@lanl.gov



Waste and Residue Nondestructive Assay Measurements (MCA-248)

April 10–14, 2000 (tentative)

Designed for DOE employees and contractors and facility personnel who are involved in the measurement and accounting of waste and residue materials. Employees of other organizations are accepted on a space-available basis. The course will be of most interest to experienced radioactive measurement technicians who operate assay instruments and their technical supervisors. Also, auditors and regulators who must judge the results of the measurements and make declarations on the hazardous material documents may benefit from this course.

Course length — 4.5 days (36 hours)

The course begins with lectures on waste and residue assay requirements for safeguards, waste characterization requirements to meet waste acceptance criteria, and neutron- and gamma-ray-based waste and residue NDA techniques. Five major course modules provide hands-on training with actual instruments used to assay radioactive isotopes in 200-L drums: (1) segmented and tomographic gamma-ray scanners, (2) neutron coincidence counting with add-a-source, (3) the ^{252}Cf shuffler, (4) the differential die-away technique, and (5) combined thermal/epithermal neutron interrogation. The course concludes with a workshop between instructors and students on the particular waste problems of most interest to students. Activities involve the use of radioactive materials. Attendance is limited to 24 students.

Goals of the course

- Provide an understanding of current DOE safeguards and characterization issues associated with waste and residue measurements.
- Provide hands-on training in the operation and use of major waste and residue NDA systems.
- Provide knowledge needed to apply appropriate measurement techniques to the waste and residue materials present in facilities.

Prerequisites Some experience with nuclear radiation measurement equipment and techniques is desirable. Attendees should have a rudimentary knowledge of gamma-ray spectroscopy and neutron counting, but these topics will be reviewed. Although not required, successful completion of CTA course MCA-140 and MCA-241 or equivalent experience are recommended.

Technical Contact Norbert Ensslin 505-667-2444 nenssln@lanl.gov

January 2000

February 7–11
MCA-243

March 13–17
MCA-111

April 10–14*
MCA-248

May 15–19
MCA-343

June 12–16
MCA-241

July

August

September 13–15
MCA-230

October 16–20
MCA-244

November

December

* tentative

Gamma-Ray Spectroscopy for Nuclear Materials Accounting (MCA-343)

May 15–19, 2000

Designed for experienced practitioners in the area of nuclear material assays for material accounting and process control. The course is open to DOE employees, contractors, and facility personnel who manage or perform nuclear material assays. Employees of other organizations are accepted on a space-available basis.

Course length — 3.5 days (28 hours)

This course covers the use of high-resolution gamma-ray spectroscopy to measure various uranium and plutonium materials. Topics include uranium and plutonium isotopics measurements and transmission-corrected assay techniques. Other assay topics, such as absorption-edge densitometry, x-ray fluorescence, and segmented and tomographic scanning, are covered in lecture presentations and/or reference materials. Students use a bench-top apparatus and participate in measurement exercises to acquire advanced assay skills and to understand underlying principles. Activities involve the use of radioactive materials. Attendance is limited to 24 students.

Goals of the course

- Provide hands-on measurement experience with advanced, high-resolution gamma-ray assay methods.
- Demonstrate state-of-the-art advanced NDA instrumentation and methodologies developed for critical MC&A applications.
- Provide an understanding of measurement physics and data analysis techniques for application to various NDA problems.

Prerequisites Previous experience with nuclear radiation measurement equipment is recommended. Familiarity with nuclear radiation and associated mathematics is assumed. Although not required, successful completion of CTA course MCA-140 and completion of MCA-241 or equivalent experience are recommended.

Technical Contact Steve Hansen 505-667-6948 shan@lanl.gov



Nondestructive Assay Techniques for Safeguards Practitioners (MCA-241)

June 12–16, 2000

Designed for experienced practitioners in the area of nuclear material assays for material accounting and process control. The course is open to DOE employees, contractors, and facility personnel who manage or perform nuclear material assays for these purposes. Employees of other organizations are accepted on a space-available basis.

Course length — 4.5 days (36 hours)

This course is an introduction to the NDA of nuclear materials using both gamma-ray and neutron measurement techniques. Topics include gamma-ray and neutron interactions with matter, detectors, uranium enrichment measurement, transmission-corrected gamma-ray assays, neutron singles counting, and both active and passive neutron coincidence counting. Both uranium- and plutonium-bearing materials are measured. Curriculum involves plenary lectures to introduce the topics, followed by hands-on laboratory measurements to illustrate the concepts. Activities involve the use of radioactive materials. Attendance is limited to 32 students.

Goals of the course

- Provide firsthand measurement experience with neutron and gamma-ray assay methods.
- Demonstrate the NDA instruments available for needed measurements.
- Provide the knowledge to apply appropriate measurement techniques to various NDA problems.

Prerequisites Previous experience with nuclear radiation measurement equipment and familiarity with nuclear radiation and associated mathematics are assumed. Although not required, successful completion of CTA course MCA-140 is recommended.

Technical Contact David Bracken 505-667-3890 bracken@lanl.gov

January 2000

February 7–11
MCA-243

March 13–17
MCA-111

April 10–14*
MCA-248

May 15–19
MCA-343

June 12–16
MCA-241

July

August

September 13–15
MCA-230

October 16–20
MCA-244

November

December

* tentative

Statistical Concepts in Nuclear Safeguards (MCA-230)

September 13–15, 2000

Designed for DOE employees, contractors, and facility personnel who are involved in the control and accountability of nuclear materials as a part of an overall safeguards program and who have some responsibility for implementing the statistical concepts in the analysis of safeguards data. Employees of other organizations are accepted on a space-available basis.

Course length — 2.5 days (20 hours)

This course is designed around a processing facility and a storage facility. Realistic simulated data are used for the throughputs and inventories. The instruction emphasizes the proper statistical treatment of sampling plans and detection probability in the storage facility. Topics addressed for the processing facility include near-real-time accountancy with small and large material balance areas, propagation and analysis of variance, quality control for measurements, sample exchange programs, shipper-receiver differences, measurement challenges with heterogeneous materials, and statistical concepts in designing NDA methods. Additional topics include statistical difficulties from poorly estimated error variances, fluctuating holdup, and assessment of the possibility of undeclared activities. There will be a brief review (as needed) of basic statistical concepts including hypothesis testing, regression, and making inferences about population parameters using sample statistics. Attendance is limited to 35 students.

Goals of the course

- Describe a wide range of statistical techniques for analyzing materials accounting data.
- Prepare participants to apply statistical methods to evaluate materials accounting data.
- Identify procedures to ensure statistically sound and consistent materials accounting data.
- Describe the use of statistical techniques to address difficult measurement problems and to identify undeclared activities.

Prerequisites Participants should be familiar with the equivalent of the material presented in the annual Materials Accounting for Nuclear Safeguards course (MCA-111). Although not required, successful completion of CTA course MCA-101 is recommended.

Technical Contact Tom Burr 505-665-7865 tburr@lanl.gov

Calorimetric Assay Training Course (MCA-244)

January 2000

February 7–11
MCA-243

March 13–17
MCA-111

April 10–14*
MCA-248

May 15–19
MCA-343

June 12–16
MCA-241

July

August

September 13–15
MCA-230

October 16–20
MCA-244

November

December

* tentative

October 16–20, 2000

Designed for DOE employees, contractors, and facility personnel who are involved in the measurement and accounting of nuclear materials. This course will be of interest to professionals who may operate calorimeters, manage calorimeter operations, or evaluate calorimetry measurements for nuclear material accountability. Employees of other organizations are accepted on a space-available basis.

Course length — 3 days (24 hours)

This course provides a comprehensive overview of the theory and application of calorimetric assay to plutonium- and tritium-bearing materials. Lectures and laboratory exercises provide personalized instruction and hands-on experience. Topics include principles and applications of heat-flow calorimeters for determining the thermal power emitted from plutonium and tritium, high-resolution gamma-ray measurements for calculating isotopic composition and specific power, conversions of measured thermal power into an assay result, increasing calorimeter throughput, and considerations of heat standards and measurement control. Activities involve the use of radioactive materials. Attendance is limited to 16 students.

Goals of the Course

- Establish familiarity with basic concepts of calorimetric assay.
- Provide hands-on experience with application of calorimetric measurements.

Prerequisites Some experience with nuclear radiation measurement equipment is desirable, as is familiarity with nuclear radiation and associated mathematics. Although not required, successful completion of CTA course MCA-140 is recommended.

Technical Contact Cliff Rudy 505-665-0116 crudy@lanl.gov

Advanced Neutron NDA Techniques (MCA-342)

Coming again in 2001!

Designed for experienced nuclear safeguards practitioners responsible for materials accounting measurements using neutron-based NDA techniques. The course is open to DOE employees, contractors, and facility personnel who manage or perform nuclear material assays for these purposes. Employees of other organizations are accepted on a space-available basis.

Course length — 4.5 days (36 hours)

This workshop covers neutron-based methods for the NDA of nuclear materials. Topics include:

- passive and active coincidence counting techniques and data corrections,
- passive multiplicity counting calibration and data correction procedures,
- californium shuffler-based delayed neutron counting, and
- neutron-generator-based multiplicity analysis and pulse-arrival-time recording electronics.

Lectures cover the underlying principles of these techniques. Hands-on laboratory exercises illustrate the techniques with appropriate nuclear material samples in an interactive workshop format. Activities involve the use of radioactive materials. Attendance is limited to 16 students.

Goals of the course

- Provide in-depth information on major neutron-based NDA techniques.
- Identify neutron NDA techniques for various nuclear measurement problems.
- Describe corrections to neutron assay data that improve precision and accuracy.

Prerequisites Experience with nuclear radiation measurement equipment is assumed, as is familiarity with nuclear radiation and associated mathematics. Although not required, successful completion of CTA course MCA-140 and completion of MCA-241 or equivalent experience are recommended.

Technical Contact Norbert Ensslin 505-667-2444 nenssln@lanl.gov



Other Safeguards Training Courses in Materials Control and Accounting

January 25, 2000
*Statistical Concepts
in MC&A*

February 7
MC&A Survey Procedures

February 29
*Tamper Indicating Device
(TID) Program*

March 13
*Nuclear Materials
Management and
Safeguards System I*

April 10
*Basics of
Nuclear Materials
Accountability*

May 1
*Measurement Control
for MC&A*

May 22
*Basics of Nuclear
Materials Control*

June 5
Sampling Plans for MC&A

available from
the DOE Central Training Academy (CTA)
of the Nonproliferation and National Security Institute (NNSI)

The CTA and NNSI are located in Albuquerque, New Mexico on Kirtland Air Force Base.

The following CTA courses are currently scheduled for Fiscal Year 2000:

Course title	Location	Beginning date & time
Basics of Nuclear Materials Accountability	Oak Ridge, TN	4/10/2000 8 AM
Basics of Nuclear Materials Control	NNSI Rm 2020	5/22/2000 8 AM
MC&A Survey Procedures	NNSI Rm 2020	2/7/2000 8 AM
Measurement Control for MC&A	NNSI Rm A-1	5/1/2000 8 AM
Nuclear Materials Management & Safeguards System (NMMS) I	NNSI Rm 2020	3/13/2000 8 AM
Sampling Plans for MC&A	NNSI Rm A-1	6/5/2000 8 AM
Statistical Concepts in MC&A	DOE ITV	1/25/2000 10 AM
Tamper Indicating Device (TID) Program	NNSI Rm 2020	2/29/2000 8 AM



For more information on other courses offered
by the CTA, details on the above MC&A courses,
general questions, or to register for any course,
consult the NNSI Home Page at

<http://www.nnsi.doe.gov>

You can also talk to the MC&A department at the NNSI by calling 505-845-5170
and asking for extension 260, or by faxing the MC&A department at 505-845-6434.

Basics of MC&A Measurements

(MCA-140)

Designed for entry-level or newly assigned DOE or DOE-contractor personnel who perform, evaluate, or have responsibility for nuclear materials measurements.

Course length — 4 days (32 hours) — 3 credit hours

This course presents an overview of nuclear materials measurement techniques including destructive analysis, nondestructive analysis, and process measurements. Also discussed is the variability of measurements and measurement control. The course consists of lectures, classroom exercises, and review of department guides, as applicable. Also included are written tests requiring passing scores of at least 70%.

Topics DOE Federal Technical Qualification Program Competency Equivalencies. For current information about which competency is addressed by successful participation in this course, call Customer Services at 505-845-5170, ext. 310.

Goals of the course

Upon successful completion of this course, attendees will

- Have a basic understanding of the types, applications, and limitations of MC&A measurements.
- Have an appreciation of the measurement process, the realities of measurement data, and their resultant variability.
- Be prepared for additional site-specific MC&A measurement training or for more advanced measurement courses.

Prerequisites Successful completion of classroom or computer-based training version of Introduction to Nuclear Materials Control and Accountability (MCA-101D), and successful completion of Introduction to MC&A Measurement Programs (MCA-104D), which is available as a correspondence course.

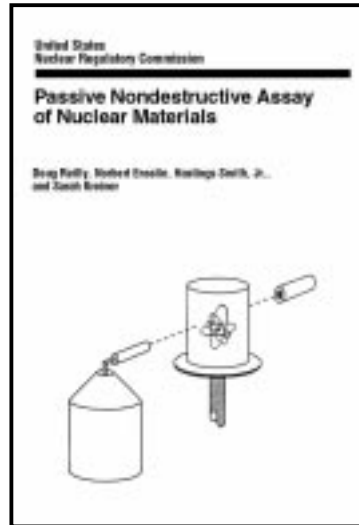
Recommendation Successful prior completion of Statistical Concepts in MC&A (MCA-130). Familiarity with DOE M 474.1-2, Nuclear Materials Management and Safeguards Reporting and Data submission.



Offered by
the DOE Central Training
Academy of the DOE
Nonproliferation
and National
Security Institute.

To register
for MCA-140,
please call
505-845-5170, ext. 310.

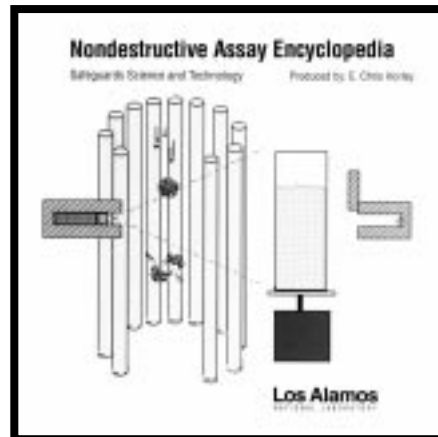
Other Reference Materials from Los Alamos



Passive Nondestructive Assay of Nuclear Materials Doug Reilly, Norbert Ensslin, Hastings Smith, and Sarah Kreiner *eds.*, Nuclear Regulatory Commission Textbook NUREG/CR-5550 (1991).

Available from:
Superintendent of Documents,
U.S. Government Printing Office
P.O. Box 37082
Washington, DC 20013-7082
202-512-1800, \$44.00.

Provided, while supplies last,
as a supplementary text in all
LANL/DOE Safeguards Training courses.



Nondestructive Assay Encyclopedia
an interactive CD-ROM-based module,
produced by E. Chris Horley from materials
in the LANL/DOE Safeguards Technology
training courses.

Presently available, in draft form,
to students in FY 2000 Safeguards
Training courses.

Currently being developed
as an interactive, CD-ROM-based
refresher training module,
to be available in 2001.

Registration Form

Fax to Cindy McAtee, 505-665-5055, or e-mail information to cmcatee@lanl.gov

Mr.
Ms.
Name: Dr. _____

Affiliation/Facility: _____

Occupation: _____

Address: _____

Phone: () _____ Fax: () _____

e-mail: _____

Social Security No.: _____ Clearance Level: _____

Do you have a standard DOE green badge? _____

Registration for what course(s)?

**The cost of each course is \$500 for all but DOE federal employees,
who are charged only a \$150 materials & supplies fee.**



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● announcing

LANL/DOE *Safeguards Technology Training*
Current roster of courses

&

2000 Course Offerings



DETAILS INSIDE!